



Relationship between Vitamin D and Psoriasis

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Abstract

Psoriasis is a chronic inflammatory disease with immune involvement and increasing of keratinocytes in skin that manifest as dermatitis. Meanwhile, psoriasis is a systemic disease that affected other organs and can increase risk of metabolic disorders and chronic disease. Although, the etiology of psoriasis is not fully revealed but several factors such as genetic, auto-immunity and spiritual condition can affect presentation and development of disease.

Because vitamin D other than diet, is synthesized in the skin so it is proposed that this vitamin can affect cutaneous immune system. With regard to reports of many studies, vitamin D could have anti-proliferative and anti-inflammatory effects on skin diseases such as psoriasis. In many studies it is surveyed effects of topical therapy of vitamin D as adjunctive treatment in psoriasis and in a few of them performed in related to oral supplementation of this vitamin. Thus, it is necessary to represent effectiveness of vitamin D supplementation (as topical or oral) and reveal involvement mechanisms of this vitamin on psoriasis as a inflammatory skin disease.

Keywords: Auto-immunity, Inflammatory disease, Keratinocytes, Psoriasis, Vitamin D

Introduction

Psoriasis is a chronic autoimmune and inflammatory disease [1]. That is characterized by hyperproliferation of keratinocytes, dysfunction of epidermal barrier in skin lesions and accumulation of activated inflammatory cells [2]. The primary manifestation of psoriasis is revealed on the skin as dermatitis although inflammatory processes may involve other organs [3]. Also, psoriasis is a systemic disease so that other than skin, can increase risk of metabolic disorders such as obesity [4], cardiovascular diseases [5] and even stroke [6]. Psoriasis involves the innate and acquired immunologic systems [7]. This lead to produce so many T-cells and pro-inflammatory cytokines in circulation. The overload T-cells especially T- helper1 and increasing in proliferation of keratinocytes cause development of psoriasis plaques [8]. The prevalence of psoriasis in adulthood is estimated in range between 0.27 % and 11.4 % that related to age, sex, geography, genetic and environmental factors [9].

Psoriasis presented as many kinds include: Plaque Psoriasis (vulgaris), Guttate Psoriasis, Invers Psoriasis, Pustular Psoriasis, Erythrodermic Psoriasis, Nail Psoriasis and Psoriatic arthritis [10]. The etiology of psoriasis is not fully detected but it is thought that several factors affect its development such as genetic, auto-immunity condition, hormonal status and psychosomatic issues [11]. It is proposed that vitamin D has roles related to psoriasis due to synthesized in skin and action on cutaneous immune system [12]. It is reported that vitamin D might act as a modulator of immune and inflammation mechanisms [13]. Vitamin D has many biological functions such as multiplication and differentiation of keratinocytes [14]. However, most studies focused on topical therapy and only a few studies have revealed the effectiveness of oral vitamin D in treatment of psoriasis [10]. Besides, there is controversy in effectiveness of vitamin D supplementation as adjunctive treatment in this disease [13,15,16]. Thus, it is necessary to survey efficacy of vitamin D in management of psoriasis.

Vitamin D and Its Roles

Vitamin D is a fat-soluble hormone-like that available for body from diet and synthesize in the skin by exposure to radiation from sunlight [17]. Vitamin D from two manner as Vitamin D₃, is transferred to liver for hydroxylation and change to 25 OH D₃. This form of D enter in circulation and currently considered regular biomarker of the serum vitamin D level but is not the most active of vitamin unless it transfer to kidneys and change to 1,25(OH)₂ D₃ or Calcitriol by further hydroxylation [18]. Other than simple diffusion, absorption of calcium and phosphorus in the intestine perform via active transport that do with inducing and making of transport protein by Calcitriol in mucosa (as the most important role) that enhancing of absorption. Then, these minerals participate in several organs such as bones, muscles, brain, and others [18].

In last decade, it is concentrated to functions of vitamin D other than calcium-phosphorus metabolism in bones. It is demonstrated that vitamin D performs different tasks include role in Excretion of insulin from β -cells of pancreas, modulation of Immune system, barrier integrity and permeability of membrane and regulation of keratinocytes proliferation and differentiation [12].

Psoriasis and Vitamin D

Psoriasis is a inflammatory skin disease with involving of immune system. Dysfunction of immunity in organ lead to activation of lymphocytes T (T-cells) particularly T-helper 1 that produce many cytokines such as interleukin 2, interleukin 6, tumor necrosis factor alpha (TNF- α) and interferon gama (IFN- γ). These disturbances of immune function make tissue changes and inflammatory skin [19]. One of the most important task of vitamin D is modulation and regulation of cutaneous immune system as inhibition of T cell proliferation [12]. This vitamin inhibits the expression of pro-inflammatory cytokines produced by T lymphocytes [19]. Vitamin D helps to synthesis of glycosylceramides in the skin and via regulate barrier integrity and permeability in this organ that lead to improve of injured tissue [16]. This action due to role of vitamin D in regulation of level of calcium in cell and effect on calcium receptor and activity of phospholipase C enzymes [20]. It is showed that alterations in level of calcitriol and polymorphisms of the vitamin D receptor gene could lead to several disorders and autoimmune diseases, including psoriasis [21,22]. It is reported that level of serum calcitriol [1,25 (OH)₂ D₃] in psoriasis patients is lower than healthy subjects [23] specially in psoriatic arthritis [24]. Also, It is revealed that serum vitamin D was lower in women than men [25]. In addition, expression of vitamin D receptor decreased in skin of psoriasis patients that lead to lower expression of tight junction proteins [26]. Therefore, low level of vitamin D is inversely associated with predisposing of inflammatory condition [23].

5.1. Use of vitamin D in treatment of psoriasis

Attention to vitamin D in treatment of psoriasis have been known since 1985 and effectiveness of this vitamin reported in

several studies [25,27]. Thenceforward, physician applied topical form of vitamin D for cure of psoriasis plaque as the first-line medication singly or in combination with topical corticosteroids [28-31]. Also, topical treatment with vitamin D have not any serious side effects in comparison to corticosteroids [13,32]. The therapeutic function of vitamin D as topical perform via mechanism related to its receptors that lead to inhibition of proliferation and differentiation of keratinocyte by increasing intracellular calcium [33]. Also, topical vitamin D may inhibit cytokines such as IL-2, IL-6, and interferon-gamma and via suppress inflammation [34].

Most performed studies in related to effects of vitamin D on psoriasis were in form topical [10]. However, use of oral administration of vitamin D in treatment of psoriasis come back to many years ago. But it is deposited due to probably side effect as hypercalcemia [35]. Indeed, from 1985 to the present, only a few research have evaluated the effectiveness of oral vitamin D in treatment of psoriasis and results were controversy so that degree of efficacy of supplementation was not significant in some of them [10]. It was not investigated the optimal dose of oral vitamin D in any study. However, most studies reported that oral vitamin D in within range 0.25 – 2 μ g (10 – 80 IU) per day have not obvious side effect. [10]. Of course, it is not reported side effects of vitamin D as oral (systemic) administration with higher doses such as 40000 IU per day [36]. However, no evidence has been reported about the efficacy of the highest doses of oral vitamin D in treatment of psoriasis [10].

Furthermore, Vitamin D treatment is not effective for all patients with psoriasis [35,37,38]. The reviews of studies in use of oral vitamin D in psoriasis were inconclusive and controversial. Thus, it is necessary that more large studies performed to show the efficacy, optimal dose, and side effects of oral vitamin D in patients with psoriasis [10]. Now, topical vitamin D or its analogs such as Calcipotriol apply effectively and safe in treatment of psoriasis without systemic side effects [35,37].

Conclusion

Psoriasis as a inflammatory disease accompany with immune system disturbance and it is presented several kinds. Vitamin D could affect this dysfunction due to its task in immune modulation. Among several kinds of vitamin D supplementary, topical D is more effectiveness than oral form and today it is considered as one of the medications for treatment of psoriasis. However, there is a challenge in apply administration of vitamin D and need to more research for confirming of this effect on psoriasis.

Conflict of interest

The author has declared no conflict of interest.

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References

- Rendon A, Schäkel K (2019-20) Psoriasis pathogenesis and treatment. *Int J Mol Sci* 1475: 1-28.
- Nestle FO, Kaplan DH, Barker J (2009) Psoriasis. *N Engl J Med* 361(5): 496-509.
- Napolitano M, Caso F, Scarpa R, Megna M, Patri A, et al., (2016) Psoriatic arthritis and psoriasis: differential diagnosis. *Clin Rheumatol* 35(8): 1893-901.
- Kimball AB, Gladman D, Gelfand JM, Gordon K, Horn EJ, et al., (2008) National Psoriasis Foundation clinical consensus on psoriasis comorbidities and recommendations for screening. *J Am Acad Dermatol* 58: 1031-42.
- Joel M Gelfand, Andrea L Neimann, Daniel B Shin, Xingmei Wang, David J Margolis, et al., (2006) Risk of myocardial infarction in patients with psoriasis. *Jama* 296: 1735-1741.
- Joel M Gelfand, Erica D Dommasch, Daniel B Shin, Rahat S Azfar, Shanu K Kurd, et al., (2009) The risk of stroke in patients with psoriasis. *The Journal of investigative dermatology* 129: 2411-2418.
- Furue M, Kadono T (2016) Psoriasis: behind the scenes. *J Dermatol* 43: 4-8.
- Brown A, Slatopolsky E (2008) Vitamin D analogs: Therapeutic applications and mechanisms for selectivity. *Mol Asp Med* 29: 433-452.
- Enamandram M, Kimball AB (2013) Psoriasis epidemiology: the interplay of genes and the environment. *J Invest Dermatol* 133: 287-9.
- Stanescu AMA, Simionescu AA (2021) Diaconu CC. Oral Vitamin D Therapy in Patients with Psoriasis. *Nutrients*, pp. 13-163.
- Lebwohl M (2003) Psoriasis. *Lancet* 361(9364): 1197-204.
- Barrea L, Savanelli M, Somma C, D, Napolitano M, Megana M, et al., (2017) *Rev Endocr Metab Disord* 18: 195-205.
- Mattozzi C, Paolino G, Richetta AG, Calvieri S (2016) Psoriasis, vitamin D and the importance of the cutaneous barrier's integrity: an update. *J Dermatol* 43(5): 507-14.
- Mishal AA (2001) Effects of different dress styles on vitamin D levels in healthy young Jordanian women. *Osteoporos Int* 12: 9315.
- Wadhwa B, Relhan V, Goel K, Kochhar AM, Garg VK (2015) Vitamin D and skin diseases: a review. *Indian J Dermatol Venereol Leprol* 81(4): 344-55.
- Soleymani T, Hung T, Soung J (2015) The role of vitamin D in psoriasis: a review. *Int J Dermatol* 54(4): 383-392.
- Pike JW, Christakos S (2017) Biology and Mechanisms of Action of the Vitamin D Hormone, *Endocrinology, and metabolism clinics of North America* 46: 815-843.
- Mahan LK, Raymond JL (2017) *Krauses food and the nutrition care process*. 14th Ed Elsevier.
- Piotrowska A, Wierzbicka J, Z' mijewski MA (2016) Vitamin D in the skin physiology and pathology. *Acta Biochim Pol* 63: 17-29.
- Hegyi Z, Zwicker S, Bureik D, Peric M, Koglin S, et al., (2012) Vitamin D analog calcipotriol suppresses the Th17 cytokine-induced proinflammatory S100 alarmins psoriasin (S100A7) and koebnerisin (S100A15) in psoriasis. *J Invest Dermatol* 132(5): 1416-24.
- McCullough PJ, Lehrer DS, Amend JJ (2019) Daily oral dosing of vitamin D3 using 5000 To 50,000 international units a day in long-term hospitalized patients: Insights from a seven-year experience. *J. Steroid Biochem. Mol Biol* 189: 228-239.
- McCullough P, Amend JJ (2017) Results of daily oral dosing with up to 60,000 international units (iu) of vitamin D3 for 2 to 6 years in 3 adult males. *J. Steroid Biochem. Mol Biol* 173: 308-312.
- Orgaz Molina J, Buendía-Eisman A, Arrabal-Polo MA, Ruiz JC, Arias-Santiago S (2012) Deficiency of serum concentration of 25-hydroxyvitamin D in psoriatic patients: a case-control study. *J Am Acad Dermatol* 67: 931-8.
- Kincse G, Bhattoa PH, Herédi E, Varga J, Szegedi A, et al., (2015) Vitamin D3 levels and bone mineral density in patients with psoriasis and/or psoriatic arthritis. *J Dermatol* 42(7): 679-84.
- Zuchi MF, Azevedo Pde O, Tanaka AA, Schmitt JV, Martins LE (2015) Serum levels of 25-hydroxy vitamin D in psoriatic patients. *A Bras Dermatol* 90(3): 430-432.
- Umar M, Sastry KS, Al Ali F, Al-Khulaifi M, Wang E (2018) Vitamin D and the pathophysiology of inflammatory skin diseases. *Skin Pharmacol Physiol* 31: 74-86.
- Miyachi Y, Ohkawara A, Ohkido M, Harada S, Tamaki K, Nakagawa H et al. Al (2002) Long-term safety and efficacy of high concentration (20 microg/g) tacalcitol ointment in psoriasis vulgaris. *Eur J Dermatol* 12(5): 463-468.
- Kircik L (2002) Efficacy and safety of topical calcitriol 3 microg/g ointment, a new topical therapy for chronic plaque psoriasis. *J Drugs Dermatol* 8(8): 9-16.
- Oquendo M, Abramovits W, Morrell P (2012) Topical vitamin D analogs available to treat psoriasis. *Skinmed* 10: 356-60.
- Mason A, Mason J, Cork M, Hancock H, Dooley G (2013) Topical treatments for chronic plaque psoriasis: an abridged Cochrane systematic review. *J Am Acad Dermatol* 69: 799-807.
- Prieto-Pérez R, Cabaleiro T, Daudén E, Ochoa D, Román M (2013) Pharmacogenetics of topical and systemic treatment of psoriasis. *Pharmacogenomics* 14: 1623-1634.
- Tremezaygues L, Reichrath J (2011) Vitamin D analogs in the treatment of psoriasis: where are we standing and where will we be going? *Dermatoendocrinology* 3: 180-186.
- Van Der Kerkhof PC (1995) Biological activity of vitamin D analogues in the skin, with special reference to antipsoriatic mechanisms. *Br J Dermatol* 132: 675-682.
- Peric M, Koglin S, Dombrowski Y, Gross K, Bradac E et al. Al (2009) Vitamin D analog differentially control antimicrobial peptide "alarmin" expression in psoriasis. *PLoS One* 4: e6340.
- Shahriari M, Kerr PE, Slade K, Grant Kels JE (2010) Vitamin D and the skin. *Clin Dermatol* 28: 663-668.
- Hata T, Audish D, Kotel P, Coda A, Kabigting, F et al., (2014) A randomized controlled double-blind investigation of the effects of vitamin D dietary supplementation in subjects with atopic dermatitis. *J Eur Acad Dermatol Venereol* 28: 781-789.
- Kragballe K (1995) Calcipotriol: A new drug for topical psoriasis treatment *Pharmacol Toxicol* 77: 241-246.
- Sintov AC, Yarmolinsky L, Dahan A, Ben Shabat S (2014) Pharmacological effects of vitamin D and its analogs: Recent developments. *Drug Discov Today* 19: 1769-1774.